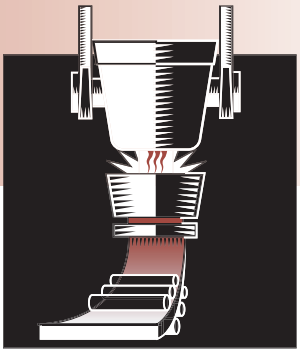
STEEL
Project Fact Sheet



An Automatic Inspection-Based Process Advising System for Steel Products at High Temperature

Unique measurement system enhances process control, reduces scrap, and saves energy

Benefits

- Would save 85 billion Btu per installation annually
- Offers savings of 1.4 trillion Btu by 2010
- Allows measurement as parts are being produced at temperatures of up to 1550°C
- Reduces the scrap rate from the process by 50%
- Detects and identifies production flaws quickly
- Inspects hot work pieces remotely, reducing employee burns
- Withstands harsh conditions

Applications

The market for the HE-Steeler is the hot rolling mills and the continuous casting segments of the steel industry.

Project Partners

NICE³ Program
Washington, DC

Indiana Department of Commerce
Indianapolis, IN

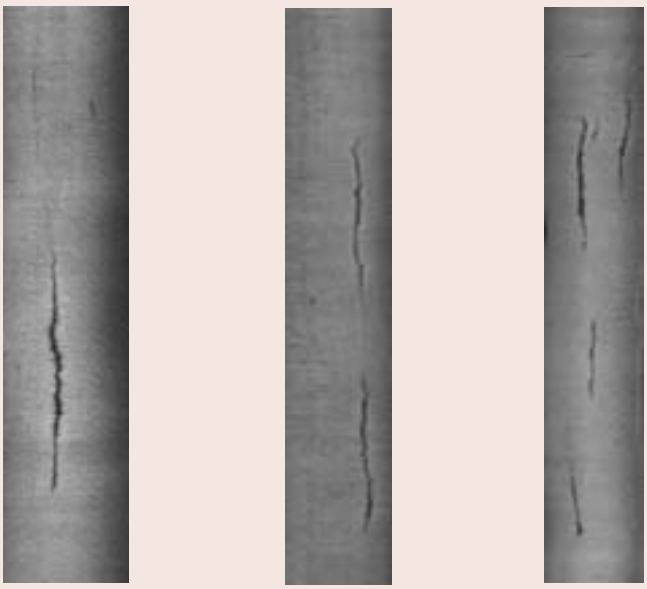
OG Technologies, Inc.
Ann Arbor, MI

Ispat Inland Inc.
East Chicago, IN

A new measurement system, the HotEye-Steeler™ (HE-Steeler), has been developed by OG Technologies (OGT). HE-Steeler is based on OGT's HotEye™ system and integrates it with a dynamic control plan (DCP) for hot steel processes. The DCP classifies defects from production and identifies root causes of them and corrective actions. The effectiveness of the DCP is dependent upon instruments able to detect quantitative quality information in real-time in a hostile operating environment.

The HotEye™ system can accurately and reliability measure the dimensions and detect the surface features, including defects, of a part while it is still red hot, i.e. at temperatures of up to 1550°C. Current measurement systems cannot be used until the parts cool down which results in higher scrap rates once defects are detected. HE-Steeler will provide real-time process control to increase yields 2.5% in continuous casting and hot rolling steel mills. This will result in energy savings, quality improvements, and productivity increases.

Three HotEye™ Images of Defects on Steel Bars



"Seams automatically detected by the HotEye™ system. Images taken and detected off bars traveling at a speed of 30 to 60 meters/sec. Image size: ~ 2mm (wide) x 2,000 mm (long)."

Project Description

Goal: Design, implement, build and test a HE-Steeler system at a hot rolling mill to prove that yields and quality of the rolled steel rods can be improved.

HE-Steeler consists of three HotEye™ imaging sensors, four powerful PC's, modulating devices for the lighting system, proprietary image processing software, protection of the hardware and software from the effects of the harsh operating environment in a steel mill, and the software version of the steel rolling DCP. HE-Steeler will automatically (a) inspect 100% of the surface of the product in-line; (b) identify defects as small as 0.025 mm; (c) analyze and record the size, nature and location of the defects; (d) measure 100% of the dimensions of the product; and (e) generate process correction advise based on the DCP, while the product is at a temperature up to 1550°C and moving at a speed up to 100 m/second.

OG Technologies, Inc., along with their partners are developing this new technology with the help of a grant funded by the NICE³ Program in the U.S. Department of Energy.

Progress and Milestones

The following are the main tasks to be performed:

- Complete the design of the scale-up system based on empirical data of the optical, thermal, mechanical and computing tests.
- Assemble the components and build in-house testing feeder to simulate the bar rolling output.
- Conduct tests and fine tune the system to ensure that the scale-up system meets the performance requirements.
- Install the system at the host site and conduct large scale testing.
- Analyze the demonstration data and optimize the system and retest it.

Economics and Commercial Potential

HE-Steeler is ready for its first industrial-scale commercial demonstration at the Ispat Inland Inc. rod mill in Indiana. All research and development have been completed. The capability of defect detection and dimensional measurement have been developed and tested at Ford Motor Company's Woodhaven Forging Plant. OGT has also demonstrated the HotEye™ technology at several hot rolling and continuous casting mills. The steel industry process DCP has been developed and used for years. The document is the basis for setting up the steel casting and rolling processes. The implementation of such DCP in software is straighforward. As an example, a ton of hot rolled bar steel currently sells for between $300 and $400. Approximately 34,585 tons of hot rolled bar steel scrap is produced annually at a typical steel plant. At an average of $350 per ton, the value of this scrap is $12 million. The selling price reflects the direct and indirect costs associated with producing scrap. Using HE-Steeler will provide the information needed to reduce scrap by 50%, thereby increasing profitability by $6 million. Improving process efficiency depends on improving the quality, quantity and timeliness of the process feedback loop. HE-Steeler will improve the process feedback loop in the hot process lines. Improving yields from 95% to 97.5% will give a steel company a competitive cost advantage. Similar economic benefits can be projected for other hot process lines, such as rolling and continuous casting, in the U.S.

Commercial introduction of the technology is expected by 2005. Annual energy savings by 2010 would be 1.4 trillion Btu with 16 units installed. By 2020 the savings would grow to 10.7 trillion Btu from 147 units.

NICE³ – National Industrial Competitiveness through Energy, Environment, and Economics:
An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry.
This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to $525,000. Grants fund up to 50% of total project cost for up to 3 years.

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